REMARKS

The Examiner has rejected claims 1, 4-9, 11, 13-18, 21-22, and 25-37 under 35 U.S.C. § 103(a) as being obvious over either one of Richards, et al. or Karlsson, et al. in view of either one of Chiba, et al. or Suzuki, et al. and further in view of Chang, et al. The Examiner also rejected claims 2, 3, 10, 12, 19, 20, and 23-24 under 35 U.S.C. § 103(a) as obvious over the combined prior art set forth above as applied to the claims above, and further in view of Ajioka and Barrett, et al. Additionally, the Examiner rejected claims 7-12 under 35 U.S.C. § 112, first paragraph. Further, the Examiner rejected claims 1-37 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Finally, the Examiner objected to the disclosure because of a minor informality. Each of these objections and rejections is addressed individually below.

The Objections to the Disclosure:

The Examiner objected to the disclosure because of a minor informality. Specifically, on page 8 of the application, the term aperture 24 is described, but is not shown in the drawings. Accordingly, reference number 24 has been added to figure 2 and a proposed drawing correction illustrating this addition in red is being submitted herewith. Upon an indication that this use is in condition for allowance, formal drawings will be submitted.

The § 112 First Paragraph Rejections:

The Examiner rejected claims 7-12 under 35 U.S.C. § 112, first paragraph, as containing subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor at the time the application was filed had possession of the claimed invention. Specifically, the Examiner indicated that the subject matter of claim 7 was not sufficiently disclosed with respect to the use of "a plurality of multiplexer devices . . . each in communication with one of said . . . elements." Claim 7 has been amended to reflect that the multiplexer device is in communication with each of the elements. It is therefore submitted that the section 112 first paragraph, rejections have been overcome and that these rejections should therefore be withdrawn.

The § 112 Second Paragraph Rejections:

The Examiner rejected claims 1-37 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention. Specifically, the Examiner objected to the preamble of claims 1, 7, 21 and 37 as failing to make clear that the device was for use in connection with a satellite communication system. The preamble of each of these claims has been amended to clarify the relationship between the antenna and the satellite communication system.

The Examiner also rejected various claims due to the inclusion of the phrase "digital beam forms". As suggested by the Examiner, these claims have been amended to remove the term "form", which the Examiner believed was indefinite. It is therefore respectfully submitted that the section 112, second paragraph, rejections have been overcome and that these rejections should also be withdrawn.

The § 103 Rejections:

The Examiner rejected claims 1, 4-9, 11, 13-18, 21-22, and 25-37 under 35 U.S.C. §103(a) as obvious over either Richards, et al. or Karlsson, et al. in view of either one of Chiba, et al. or Suzuki, et al and further in view of Chang, et al.

As the Examiner recognized, both Richards, et al. and Karlsson, et al. fail to teach the use of at least the following: (1) a digital beam former including a multiplexer associated with each of the plurality of radiation elements, (2) an analog to digital converter, and (3) a digital receiver for converting the digital beams into an information signal. These differences are significant in that applicants' claimed invention scans for wave signals and then based on the received wave signals converts them into information streams. From this information, the antenna can determine where the various satellites in the equatorial satellite constellation are located for purposes of establishing communication therewith.

Specifically, with respect to Richards, et al., this reference fails to disclose any details regarding its beamforming. In fact, there is no teaching or suggestion in Richards, et al. to utilize digital beamforming techniques or a digital beamformer. The Examiner's statement that it would be obvious to modify Richards, et al. by substituting a digital beamformer constitutes clear hindsight reconstruction to combine the aspects of the other reference. To sustain such an obviousness rejection, there must be some teaching or suggestion in the reference to combine the aspects of the other reference. Here, no such teaching exists, and thus independent claims 1, 7, 13, 21, 30 and 37, which each require digital beamforming, are all submitted to be allowable over the Richards, et al. reference for this reason alone.

Similarly, Karlsson, et al. fails to disclose any details about digital beamforming. Moreover, Karlsson, et al. specifically teaches away from using digital beamforming to receive and convert wave signals into information streams by which the location of satellites in the constellation is determined. At column 7, lines 41-45, Karlsson, et al. states:

> the circuitry of the radio communications system of which the antenna 11 forms a part, is told by a beacon signal from the satellite system, the precise position at which the next coming satellite will appear on the horizon.

Thus, the radiation elements themselves do not convert the received wave signals into information streams to determine the positions of the satellites, as required by the claims of applicants' invention. As such, each of independent claims 1, 7, 13, 21, 30 and 37 are also allowable over the Karlsson, et al. reference for this reason alone.

Claims 21 and 37 are all submitted to be allowable over each of Richards, et al. and Karlsson, et al. for the additional reason that each of these claims requires a plurality of elongated radiation elements positioned on the rotating circular plate for electronically scanning for wave signals and elevation. Initially, neither Richards, et al. nor Karlsson, et al. teach a rotating circular plate upon which radiation elements are mounted. Further, neither Richards, et al. or Karlsson, et al. teach a plurality of elongated radiation elements -- let alone a plurality of radiation elements each having a multiplexer associated therewith. Thus, it is submitted that claims 21 and 37 are allowable for this additional reason.

Claim 37 further requires that the plurality of elongated radiation elements are positioned on the rotating plate such that they are parallel to one another. Again, this is not taught or suggested by either Richards, et al. or Karlsson, et al. Thus, it is submitted that these claims are allowable over these references for this additional reason.

Further with respect to the Karlsson, et al. reference, claims 1, 7 and 13 all require that the antenna is able to lock onto a second equatorial satellite in the constellation before locking off a first equatorial satellite. The Examiner states that Karlsson, et al. teaches this configuration. The applicants, however disagree. Karlsson, et al. teaches calculating an estimated time and location when a second satellite will come into a field of view and then thereafter calculating an estimated vector such that one beam will move from the first satellite to the second satellite at the estimated handoff time when it is determined that the first and second satellites are both in the field of view. In other words, Karlsson teaches moving the beam from

one satellite to a second satellite not multiple beams each in communication with a pair of satellites. This is contrary to applicants' claimed invention which has multiple beams with one beam in communication with a first satellite and after the location of a second satellite has been determined based on received waveforms a second beam connects to the second satellite regardless of the estimated time or position. It is thus submitted that claims 1, 7 and 13 are allowable for this additional reason.

It is therefore submitted that applicants' claimed invention is not obvious in view of the cited references of record and that independent claims 1, 7, 13, 21, 30, and 37 are in condition for allowance. It is also submitted that claims 2-5, 8-12, 14-20, 22-29, and 31-36, which depend respectively from one of the independent claims are allowable for the same reasons provided above in connection with the claim from which they depend.

Conclusion:

It is therefore respectfully submitted that all objections and rejections of record have been overcome and that all pending claims are in a condition for allowance.

If the Examiner should have any questions, he is urged to contact the undersigned.

Record of Telephone Interview:

The undersigned attorney called the Examiner on February 12, 2002, after receipt of the Office Action and requested specific identification (by patent number) of "Karlsson et al" which had been cited and applied in the body of the Office Action but not identified by patent number on PTO-892 or anywhere else in the Office Action. A copy of the reference was not enclosed with the Office Action. The Examiner identified the reference as U.S. Patent Number 6,034,634 and the undersigned was able to obtain a copy of the U.S. patent.

Respectfully Submitted,

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Enc.: Red-ink sketch

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claim 1 has been amended as follows:

1. (Twice Amended) An antenna for communication with an equatorial satellite constellation, the antenna being for use on a commercial satellite terminal, comprising:

a generally circular rotating plate for mechanically scanning for wave signals in the azimuth direction;

a plurality of radiation elements positioned on said circular plate for electronically scanning for wave signals in elevation; and

a multiplexor associated with each of said plurality of radiation elements for consolidating the individual wave signals received at each of said plurality of radiation elements to an analog bit stream;

an analog to digital converter for converting said analog bit stream to a digital bit stream;

circuitry for forming multiple digital beams from said digital bit stream; and

a digital receiver for converting said digital beams [forms] into an information signal;

wherein the antenna is able to lock onto a second equatorial satellite in the constellation before locking off a first equatorial satellite.

Cancel claim 6 without prejudice.

Claim 7 has been amended as follows:

7. (Twice Amended) A phased array antenna for communication with an equatorial satellite constellation, comprising:

a rotating plate for mechanically scanning for a wavefront of wave signals in an azimuth direction;

a plurality of radiation elements positioned on said rotating plate for receiving a plurality of individual waves;

apparatus for positioning said radiation elements such that a wavefront of an intended signal will be in alignment with a major axis of said plurality of radiation elements;

a [plurality of] multiplexer device[s,] [each] in communication with [one] each of said plurality of radiation elements for converting said plurality of received individual waves into an analog bit stream;

an analog to digital converter for converting said analog bit stream to a digital bit stream;

a device for forming multiple digital beams [forms] from said digital bit stream; and

a digital receiver for processing said multiple digital beams;

wherein the antenna is able to lock onto a second equatorial satellite in the constellation before locking off a first equatorial satellite.

Claim 13 has been amended as follows:

13. (Amended) A method for forming multiple beams at a commercial satellite antenna comprising:

providing a plurality of radiation elements on a surface of said commercial satellite antenna for receiving a plurality of individual wave signals;

rotating said plurality of radiation elements such that a wavefront of said plurality of individual wave signals is in alignment with a major axis of said plurality of radiation elements;

consolidating said plurality of wave signals into a single analog signal;

forming multiple beams [forms] from said single analog signal; and

transmitting said multiple beams [forms] to a plurality of satellites in an equatorial satellite constellation;

whereby the antenna is able to lock onto a second equatorial satellite in the constellation before locking off a first equatorial satellite.

Claim 14 has been amended as follows:

14. (Amended) The method of claim 13, further comprising[;] :

converting said single analog signal to a digital bit stream; and

forming multiple digital beams [forms] from said digital bit stream.

Claim 15 has been amended as follows:

15. (Amended) The method of claim 14, further comprising:

utilizing FFT techniques to form said multiple digital beams [forms] to provide for satellite retrodirectivity.

Claim 16 has been amended as follows:

16. (Amended) The method of claim 14, further comprising:

processing said multiple digital beams [forms] prior to transmitting.

Claim 21 has been amended as follows:

21. (Amended) A phased array antenna for communication with an equatorial satellite constellation, comprising:

a rotating plate for [electrically] electronically scanning for a wavefront of wave signals in elevation and for mechanically scanning for said wavefront of wave signals in an azimuth direction;

a plurality of elongated radiation elements positioned on said rotating plate for receiving a plurality of individual waves, each of said plurality of radiation elements having a major axis and a minor axis;

apparatus associated with each of said plurality of radiation elements for consolidating the wave signals received at each of said plurality of radiation elements into a first bit stream; and

a multiple beam former for forming multiple beams from said first bit stream.

Claim 30 has been amended as follows:

30. (Amended) A method of communicating with an equatorial satellite constellation, comprising:

providing a plurality of generally [planar] parallel radiation elements on a surface

of a commercial satellite antenna;

rotating said satellite antenna such that a wavefront of a plurality of individual wave signals is in alignment with a major axis of said plurality of radiation elements;

consolidating said plurality of wave signals into a single bit stream;

forming multiple beams [forms] from said single bit stream; and

transmitting said multiple beams [forms] to a plurality of satellites in the equatorial satellite constellation.

Claim 37 has been amended as follows:

37. (Amended) A commercial satellite terminal for communication with an equatorial satellite constellation comprising:

an antenna including,

a generally circular rotating plate for mechanically scanning for wave signals in the azimuth direction;

a plurality of elongated radiation elements positioned generally parallel to one another on said circular plate for electronically scanning for wave signals in elevation;

a multiplexer associated with each of said plurality of radiation elements for consolidating the individual wave signals received at each of said plurality of radiation elements to a first bit stream; and

a multiple beam former for forming multiple beams from said first bit stream.